

Remarks

Claims 1-20 are pending in the application. Claims 1-4 and 18-20 are rejected. Claims 15-17 are objected to.

Claim rejections

Section 103

Claims 1-14 and 18-20 were rejected under 35 USC 103(a) as being unpatentable over Tabata et al. (JP10-304514) ("Tabata") in view of Tezuka (US 5,195,037). The Applicant respectfully traverses. The cited references cannot support the asserted rejection for at least the reason that they do not, either singly or in combination, disclose or suggest a torque restoration control module as recited in claim 1, or restoring an output torque level as recited in independent claim 12.

The torque restoration control module as recited in claim 1 restores the output torque level restricted by the first torque restriction control module and controls a motor with the restored output torque level at a predetermined timing when an angular acceleration measured by an angular acceleration measurement module has an increase in the course of convergence of a skid. Claim 12 recites similar features in method form.

Furthermore, the cited references do not disclose or suggest a torque restriction rate setting module that, in response to detection of the occurrence of a skid by a skid detection module, sets a torque restriction rate of torque output to a drive shaft corresponding to a degree of the detected skid, as recited in independent claim 8, or a torque restriction rate correction module that, when control of a motor with the set torque restriction rate makes a torque variation out of a preset allowable range, corrects the torque restriction rate to limit the torque variation in the preset allowable range, as further recited in claim 8. Independent claim 18 recites similar features in method form.

Tabata relates to a hybrid vehicle with an engine and a motor that output power to drive wheels via a transmission. The hybrid vehicle of Tabata includes a rotational-speed sensor that measures an angular rotation speed ω of a drive wheel and a slip prediction module that determines whether $|d\omega/dt|$ (angular acceleration) reaches α or not to predict a slip, where $|d\omega/dt|$ represents the rate change in time of the angular

rotation speed ω of the drive wheel detected by the wheel rotational-speed sensor. When the downshift of the transmission is completed, the hybrid vehicle of Tabata controls the electric motor to restore the motor torque which is temporarily increased in response to the downshift of the transmission. When a slip of a drive wheel is predicted under the downshift of the transmission, the hybrid vehicle of Tabata lowers the increased motor torque with a smaller variation or lowers the motor torque with a temporary delay.

Accordingly, as recognized by the Examiner, Tabata does not disclose or suggest a feature corresponding to the torque restoration control module according to the invention as recited in claim 1, or restoring an output torque level as recited in independent claim 12.

Moreover, the hybrid vehicle of Tabata controls a motor and lowers the variation of driving power in response to prediction of an occurrence of a slip and prevents the occurrence of the slip in advance. Namely, Tabata does not relate to a control of reducing a slip in response to detection of the occurrence of the slip. By contrast, the present invention as recited in claims 8 and 18 relates to a torque restriction rate setting module that, in response to detection of the occurrence of a skid, sets a torque restriction rate of torque output to the drive shaft corresponding to a degree of the detected skid, and a torque restriction rate correction module that, when control of a motor with the set torque restriction rate makes a torque variation out of a preset allowable range, corrects the torque restriction rate to limit the torque variation in the preset allowable range. Accordingly, Tabata does not disclose or suggest the features recited in claims 8 and 18.

Turning now to Tezuka, this reference discloses a motor vehicle having a central differential for distributing output torque of a transmission to front wheels and rear wheels and a fluid-operated restricting device for restricting differential operation of the central differential so as to change torque distribution ratio. In a system of the motor vehicle of Tezuka, there are provided with torque setting means for setting a restricting torque of fluid operated multiple-disc friction clutch to a value which increases with an increase of the slip ratio of the rear wheels, correcting means for correcting the restricting torque to a predetermined fixed restricting torque for each driving condition,

and control means responsive to the fixed restricting torque for operating the fluid-operated restricting device.

The Examiner alleges that Tezuka discloses a feature corresponding to the claimed torque restoration control module. The Applicant respectfully disagrees. It appears that the feature described in Tezuka is only to calculate a rear-wheel slip ratio in accordance with the angular velocity of each wheel and control the fluid-operated restricting device to apply the restricting torque to the fluid operated multiple-disc friction clutch according to the rear-wheel slip ratio. By contrast, the present invention according to claim 1 relates to a torque restoration control module that restores the output torque level and controls a motor with the restored output torque level at a predetermined timing when an angular acceleration measured by an angular acceleration measurement module has an increase in the course of convergence of a skid. Further, as recited in claims 1 and 12, the present claims relate to controlling a motor, while Tezuka relates to a fluid-operated restricting device which is completely different from the motor of the present invention.

Therefore, claims 1 and 12 are allowable over Tabata and Tezuka, as are claims 2-7, 11, 13 and 14 for at least the reason that they depend on one of claims 1 or 12.

Additionally, as stated previously, the invention according to claims 8 and 18 relates to a torque restriction rate setting module that, in response to detection of the occurrence of a skid, sets a torque restriction rate of torque output to a drive shaft corresponding to a degree of the detected skid, and a torque restriction rate correction module that, when control of a motor with the set torque restriction rate makes a torque variation out of a preset allowable range, corrects the torque restriction rate to limit the torque variation in the preset allowable range. By contrast, as mentioned earlier, Tezuka relates to a technique of controlling a fluid-operated restricting device. The fluid-operated restricting device is controlled to apply a restricting torque to a fluid-operated multiple-disc friction clutch according to a rear-wheel slip ratio. Therefore, claims 8 and 18 are also allowable over Tezuka, as are claims 9, 10, 19 and 20 for at least the reason that they depend on one of claims 8 or 18.

In view of the above, withdrawal of the rejection of claims 1-14 and 18-20 as being unpatentable over Tabata and Tezuka is respectfully requested.

Claim objections

Claims 15-17 were objected to as being dependent on rejected base claims. Withdrawal of the objection is respectfully requested in view of the allowability of claim 12 as discussed above.

Conclusion

In light of the above discussion, Applicant respectfully submits that the present application is in all aspects in allowable condition, and earnestly solicits favorable reconsideration and early issuance of a Notice of Allowance.

The Examiner is invited to contact the undersigned at (202) 220-4323 to discuss any matter concerning this application. The Office is authorized to charge any fees related to this communication to Deposit Account No. 11-0600.

Respectfully submitted,

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